

## Claims

Druckexemplar

1. A toothbrush head having a bristle surface from which a cluster of bristles extends in a bristle direction, the head being suitable to direct incident radiation toward a surface of a tooth and to collect emitted radiation from the surface of the tooth, *characterised* in that;

the means to direct incident radiation toward the surface of a tooth, and/or the means to collect emitted radiation from the surface of the tooth comprise one or more cores within the toothbrush head and made of a material which is transparent to the incident and/or emitted radiation, and in which radiation transmitted internally within the core is guided by internal reflection within the core, the core material having a refractive index  $N^1$  and the core being surrounded by a sheath comprising a monolithic body in which the bristles of the head are mounted, and which is also of material which is transparent to the incident and/or emitted radiation, the sheath having a refractive index  $N^2$ ,  $N^1$  being greater than  $N^2$ , such that internal reflection occurs as a result of the difference in refractive index between  $N^1$  and  $N^2$ , and/or the core is surrounded by a sheath which is of a reflective material which reflects the incident and/or emitted radiation.

2. A toothbrush head according to claim 1 *characterised* in that the material which is transparent to the incident and/or emitted radiation is transparent over the wavelength range 400 – 630nm.

- A 3. A toothbrush according to claim 1 ~~or 2~~ *characterised* in that the transparent material is a transparent plastics materials.

4. A toothbrush head according to claim 1 *characterised* in that the reflective material is a metal.

- A 5. A toothbrush head according to <sup>claim 1</sup> ~~any preceding claim~~ *characterised* in that the head of the toothbrush is made of a monolithic body of a material which is transparent to the incident and/or emitted radiation and may thus guide radiation

transmitted internally within it and is coated, either wholly or partially, with a reflective coating.

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6. A toothbrush head according to <sup>claim 1</sup>~~any preceding claim~~ characterised in that the head incorporates one or more optical fibres to direct incident and/or emitted radiation respectively to and from the tooth surface.

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7. A toothbrush head according to <sup>claim 1</sup>~~any one of the preceding claims~~ characterised in that the core material is a polymethylmethacrylate and the sheath material is polyethyleneterephthalate.

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8. A toothbrush head according to <sup>claim 1</sup>~~any one of the preceding claims~~ characterised in that the core is a generally "L" shaped structure having a limb oriented in the generally longitudinal direction of the head and a limb oriented generally in the bristle direction and terminating in a surface which is substantially perpendicular to the bristle direction.

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9. A toothbrush head according to claim 8 characterised in that the bend of the "L" between the limbs is curved or bevelled to present a surface at 45° to the limbs.

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10. A toothbrush head according to <sup>claim 1</sup>~~any one of the preceding claims~~ characterised in that the cross-sectional dimension of the core is 5-95% of the cross sectional width and/or thickness of the head.

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11. A toothbrush head according to <sup>claim 1</sup>~~any one of the preceding claims~~ characterised in that the core has a surface which is substantially perpendicular to the bristle direction, so that incident radiation passing along the core may emerge from the core through this surface and from thence be directed to the tooth surface and/or emitted radiation from the tooth surface may enter the core through this surface and may be directed through the core, and a layer of transparent head

material is provided at this surface so that incident and emitted radiation passes through this transparent head material.

12. A toothbrush head according to claim 11 *characterised* in that the filament(s) comprise(s) an inner core of a material transparent to the incident and/or emitted radiation enclosed within a sheath with the properties of the core and sheath being such that internal reflection occurs within the core to guide the radiation along the sheath.

13. A toothbrush head according to claim 11 ~~or 12~~ *characterised* in that the filament(s) is/are optically connected to a core .

14. A toothbrush head according to ~~any preceding claim~~ *claim 1* *characterised* in that the bristle surface is provided with one or more bristle free areas which function as windows for radiation passing to and from the tooth surface to the toothbrush head.

15. A toothbrush head according to ~~any preceding claim~~ *claim 1* *characterised* by having one or more lenses for radiation passing to and from the tooth surface to the toothbrush head which focus emitted radiation from the toothbrush head onto the tooth surface and/or which focus or collect emitted radiation from the tooth surface.

16. A toothbrush having a head as claimed in ~~any one of the preceding claims~~ *claim 1*.

17. An injection moulding process by which a toothbrush head as claimed in ~~any one of the preceding claims~~ *claim 1* *is made*, *characterised* in that a core is first made, optionally a reflective metal layer is applied to this core, then the core is positioned in an injection mould cavity defining the shape of the monolithic body of the toothbrush head, and then the body is formed around the core by an injection moulding process.